

WHAT IS CLAIMED IS

5

1. A magnetic recording medium  
comprising:

a substrate; and

a magnetic layer made of a CoCr-based alloy and  
10 having a multi-layer structure and disposed above  
said substrate,

said multi-layer structure having a first  
magnetic layer disposed above said substrate and at  
least one second magnetic layer disposed on said  
15 first magnetic layer on an opposite side from said  
substrate,

said first magnetic layer having a Cr-content  
larger than that of said second magnetic layer, and  
having a larger sum total content of nonmagnetic  
20 elements which are other than Cr and have a larger  
atomic radius than Co than said second magnetic  
layer.

25

2. The magnetic recording medium as  
claimed in claim 1, wherein said first and second  
magnetic layers include at least one nonmagnetic  
30 element selected from a group of Pt, Ta, W and B.

35

3. The magnetic recording medium as  
claimed in claim 1, wherein said first and second  
magnetic layers include approximately 8 to 15 at% of

Pr, and approximately 1 to 6 at% of B.

5

4. The magnetic recording medium as claimed in claim 1, further comprising:

a first underlayer made of a Cr-based alloy and disposed on said substrate; and

10 a second underlayer made of a Cr-based alloy and disposed between said first underlayer and said first magnetic layer,

said second underlayer having a larger sum total content of elements other than Cr than said  
15 first underlayer.

20

5. The magnetic recording medium as claimed in claim 4, wherein said first and second underlayers include at least one element selected from a group of Mo, Ti, W, V and Ta.

25

6. The magnetic recording medium as claimed in claim 4, further comprising:

30 an intermediate layer made of a Co-based alloy and disposed between said second underlayer and said first magnetic layer.

35

7. The magnetic recording medium as

claimed in claim 1 comprising a plurality of second magnetic layers, wherein:

5       said first magnetic layer has a Cr-content larger than that of a lowermost one of said second magnetic layers disposed closest to said first magnetic layer, and has a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than the lowermost one of said second magnetic layers; and  
10       between two mutually adjacent second magnetic layers, the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a second magnetic layer disposed closer to said first magnetic layer.

15

8. A method of producing a magnetic recording medium which includes a magnetic layer  
20 made of a CoCr-based alloy and having a multi-layer structure, comprising the steps of:

(a) forming a first magnetic layer on a base layer; and

(b) forming at least one second magnetic layer  
25 on the first magnetic layer,

      said steps (a) and (b) being carried out so that a Cr-content of the first magnetic layer is larger than that of the second magnetic layer, and a sum total content of nonmagnetic elements which are  
30 other than Cr and have a larger atomic radius than Co in the first magnetic layer is larger than that of the second magnetic layer.

35

9. The method of producing the magnetic

recording medium as claimed in claim 8, wherein said steps (a) and (b) form the first and second magnetic layers to include at least one nonmagnetic element selected from a group of Pt, Ta, W and B.

5

10 10. The method of producing the magnetic recording medium as claimed in claim 8, wherein said steps (a) and (b) form the first and second magnetic layers to include approximately 8 to 15 at% of Pr, and approximately 1 to 6 at% of B.

15

20 11. The method of producing the magnetic recording medium as claimed in claim 8, further comprising the steps of:

(c) forming a first underlayer made of a Cr-based alloy on a substrate; and

25 (d) forming a second underlayer made of a Cr-based alloy between the first underlayer and the first magnetic layer,

said steps (c) and (d) being carried out so that the second underlayer has a larger sum total content of elements other than Cr than the first underlayer.

30

35 12. The method of producing the magnetic recording medium as claimed in claim 11, wherein said steps (c) and (d) form the first and second underlayers to include at least one element selected

from a group of Mo, Ti, W, V and Ta.

5

13. The method of producing the magnetic recording medium as claimed in claim 11, further comprising the step of:

10 (e) forming, as the base layer, an intermediate layer made of a Co-based alloy between the second underlayer and the first magnetic layer.

15

14. The method of producing the magnetic recording medium as claimed in claim 11, wherein said step (c) forms the first underlayer at a substrate bias voltage of approximately 0 to -150 V, and said step (d) forms the second underlayer at a substrate bias voltage of approximately -100 to -300 V.

25

15. The method of producing the magnetic recording medium as claimed in claim 8, wherein:

30 said step (b) forms a plurality of second magnetic layers;

said steps (a) and (b) are carried out so that the Cr-content of the first magnetic layer is larger than that of a lowermost one of the second magnetic layers disposed closest to the first magnetic layer, the sum total content of nonmagnetic elements which are other than Cr and have the larger atomic radius than Co of the first magnetic layer is larger than

the lowermost one of the second magnetic layers, and between two mutually adjacent second magnetic layers the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a  
5 second magnetic layer disposed closer to the first magnetic layer.

10

16. A magnetic storage apparatus comprising:

a head; and

15 at least one magnetic recording medium provided with a substrate, and a magnetic layer made of a CoCr-based alloy, having a multi-layer structure and disposed above the substrate,

said multi-layer structure having a first  
20 magnetic layer disposed above said substrate and at least one second magnetic layer disposed on said first magnetic layer on an opposite side from said substrate,

said first magnetic layer having a Cr-content  
25 larger than that of said second magnetic layer, and having a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than said second magnetic layer.

30

35